TECHNICAL NOTES

LAKE STATES FOREST EXPERIMENT STATION
U.S. DEPARTMENT OF AGRICULTURE · · FOREST SERVICE
No. 494

Design of a Cinder-Concrete Block Charcoal Kiln

During the past 5 years many new kilns have been built for the production of domestic grade charcoal. This age-old industry has been revived by the increasing popularity of charcoal-broiled food and outdoor cooking.

About 1946 the Connecticut Agricultural Experiment Station pioneered in the use of cinder-concrete blocks as a structural material for charcoal kilns.[1/] Subsequently, numerous commercial kilns of varying design and capacity have been constructed of cinder blocks. Structures of this material, when subjected to charcoal kiln temperatures (normally 800° to 1000° F.), frequently develop cracks at mortar joints and wall corners. In single-wall kilns even a slight amount of cracking permits the entry of air. This makes it difficult or sometimes impossible to seal the kiln, which is essential to successful operation.

In an attempt to remedy the problem of air leakage in conventional, single-wall kilns, the Station with the assistance of the Forest Products Laboratory designed and built near Three Lakes, Wis., an experimental cinder-block kiln with composite walls (fig. 1). The inner or kiln chamber wall is standard 8x8x16-inch cinder-concrete block. The exterior wall is corrugated sheet metal. An intervening space of 6 inches between inner and outer walls is filled with dry sand.

The kiln door is made of 8x12x16-inch cinder blocks laid up without mortar. When the kiln is sealed the exterior surface of the door is given a brush coat of mortar. Door blocks are easily removed and can be used again and again. Clay tile (chimney flue liner) is used for air intake and gas outlet ports. The kiln ceiling is 18-gauge sheet metal supported by 2-inch pipe. The flat roof supports the kiln ceiling and affords protection from the weather. Cost of materials for this 3-cord unit was about $350.

The most important feature of this design is the composite wall, which eliminates air leakage. The sand fill immediately seals cracks which inevitably develop in the masonry wall. This provides better control of incoming air during the carbonization portion of the cycle and an airtight seal during cooling. High maintenance and repair costs, common to single-wall structures, are minimized.

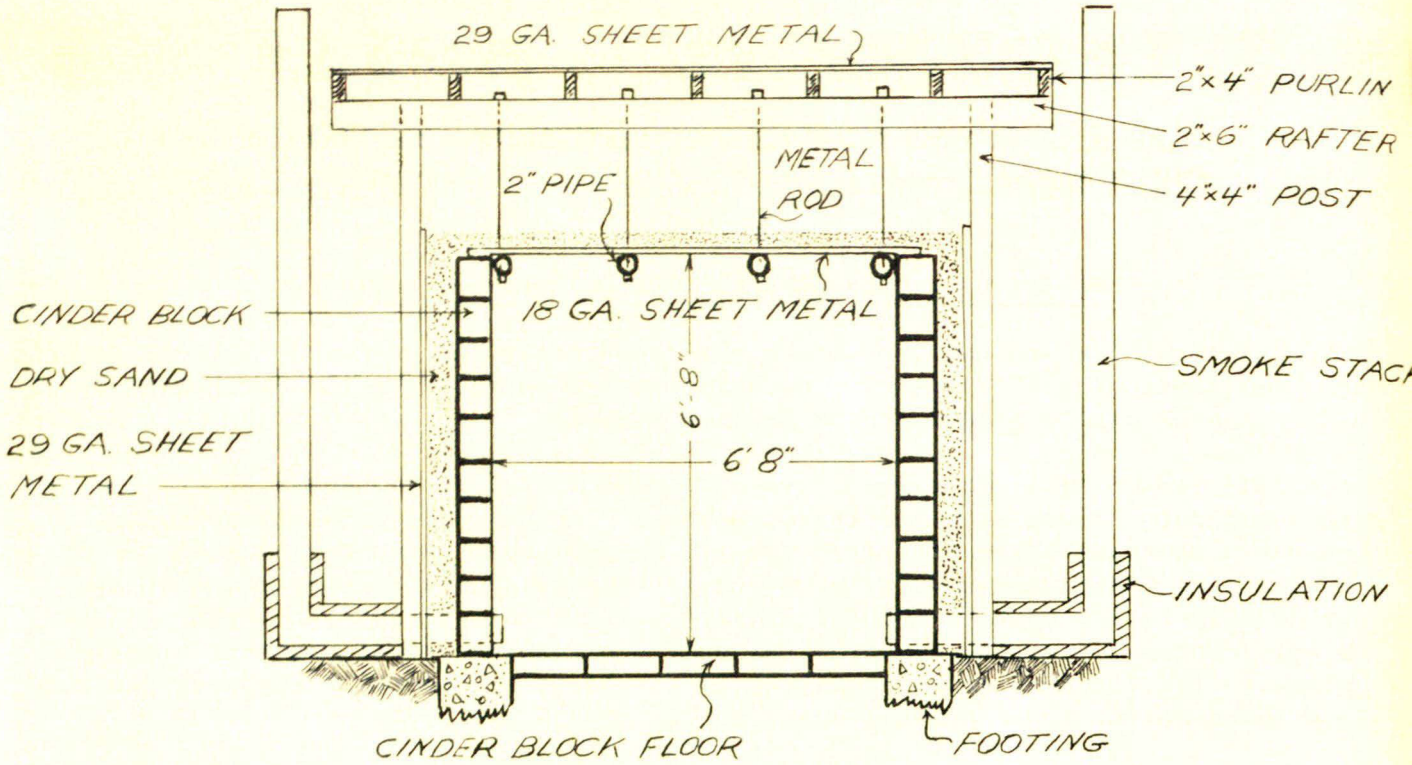
This design can be modified to meet a variety of requirements for commercial operation. For example, a metal door can be used, location of vents and air intakes can be changed, other materials such as masonry block can be used for the outer wall, and kiln capacity can be increased.

This kiln is currently being operated on an experimental basis to develop data on structure performance, operating techniques, and carbonization process. Significant information will be published from time to time as it is developed. Preliminary results from five "burns" indicate that this design provides an economical kiln capable of producing high-quality charcoal.

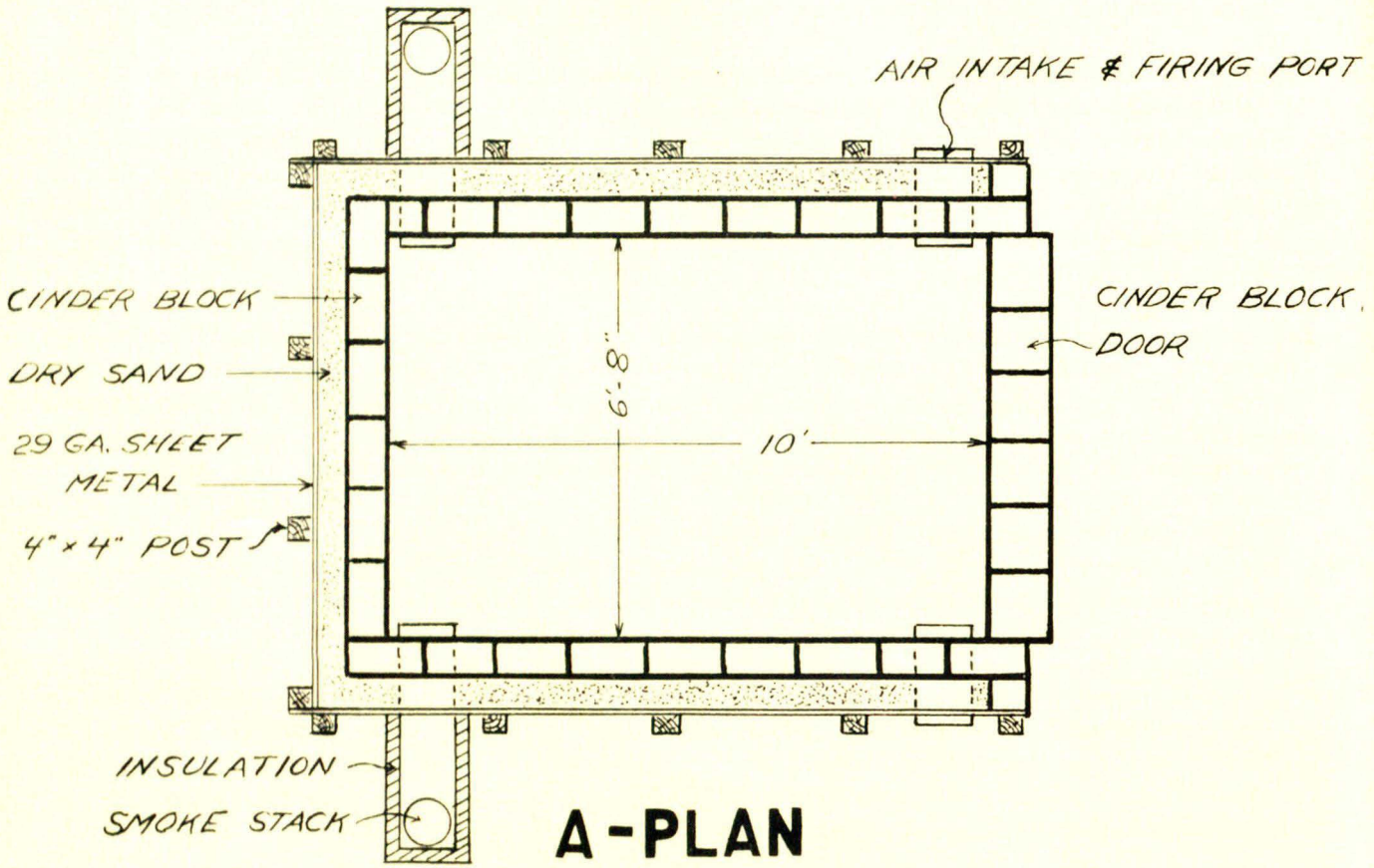
April 1957

PAUL H. LANE, Technologist

1/ Olson, A. R., and Hicock, H. W. 1946. A charcoal kiln made of cinder-concrete blocks. Conn. Agr. Expt. Sta. Bul. 494, 30 pp., illus.



B-SECTION



A-PLAN

FIGURE 1. Schematic drawing showing essential features of a $3\frac{1}{2}$-cord experimental charcoal kiln. (A) Floor plan. (B) Cross-section at smoke stacks.